



The James Webb Space Telescope: Observatory Status and the Path to Launch

Michael McElwain

JWST Observatory Project Scientist

Chuck Bowers, Mark Clampin, Mal Niedner

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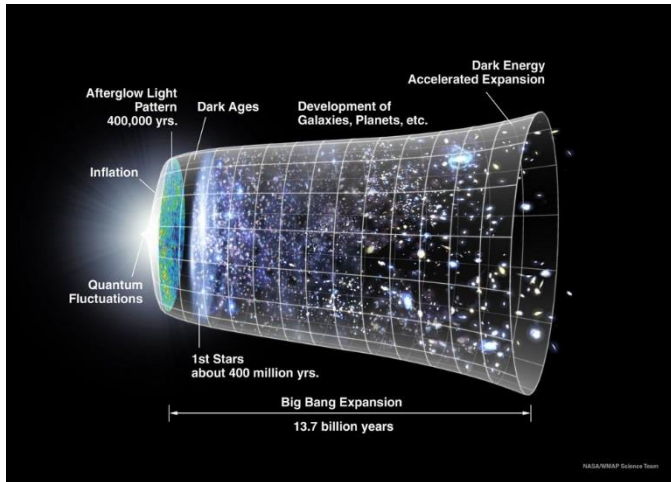




JWST Science Themes



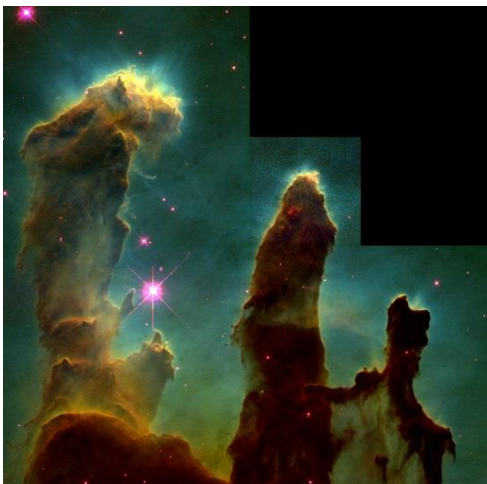
First Light & Reionization



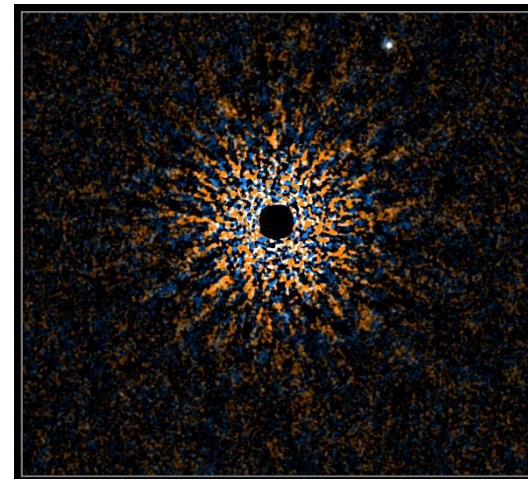
Assembly of Galaxies



Birth of Stars and Protoplanetary Systems



Planets and the Origins of Life





JWST Team



Organizations

- Mission Lead: Goddard Space Flight Center
- Project Scientist: Dr. John Mather (Nobel Laureate)
- International Partners: ESA & CSA
- Observatory Contractor: Northrop Grumman Aerospace Systems
- Operations Center: Space Telescope Science Institute

Instruments

- NIRCам (Near Infrared Camera) – Univ. of Arizona
- NIRSpec (Near Infrared Spectrograph) – ESA
- MIRI (Mid-Infrared Instrument) – ESA/JPL
- Fine Guidance Sensor/NIRISS – (FGS/NIRISS) – CSA





How JWST Works

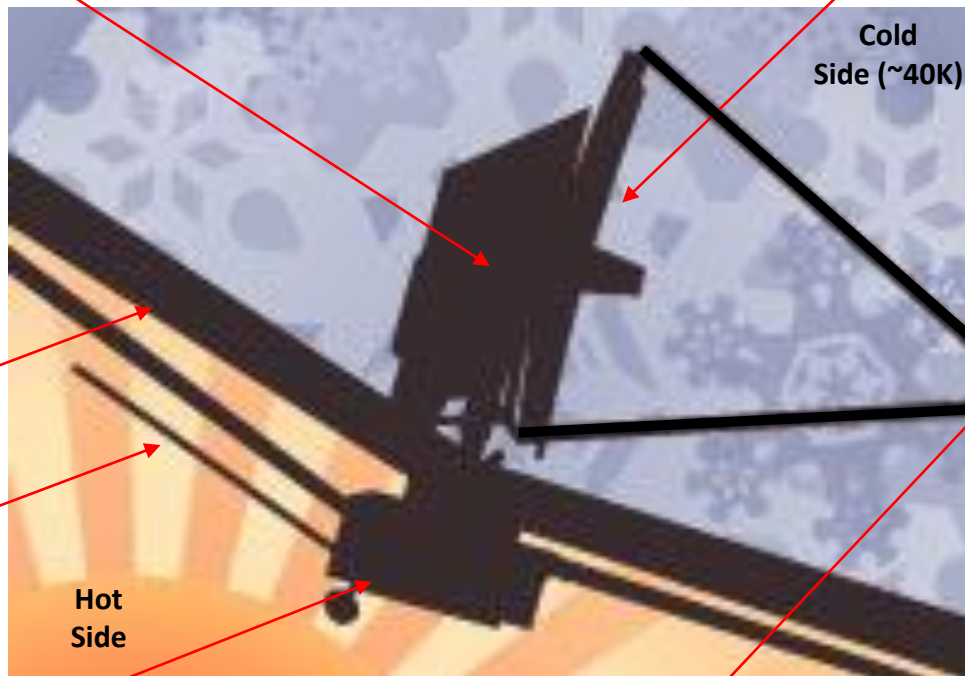
**Ariane V
Launch
Vehicle**



JWST is folded and
stowed for launch

Integrated Science
Instrument Module

JWST Deployed



5 Layer
Sunshield

Solar
Array

Hot
Side

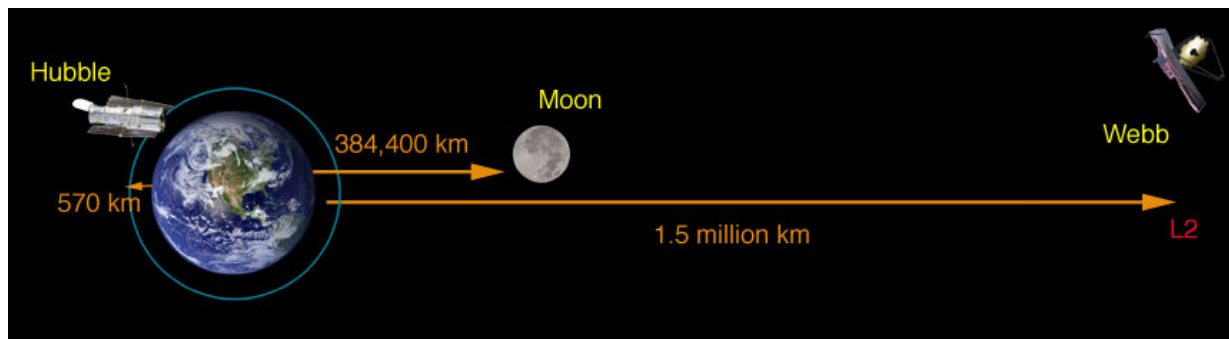
Spacecraft
Bus

Primary
Mirror

Cold
Side (~40K)

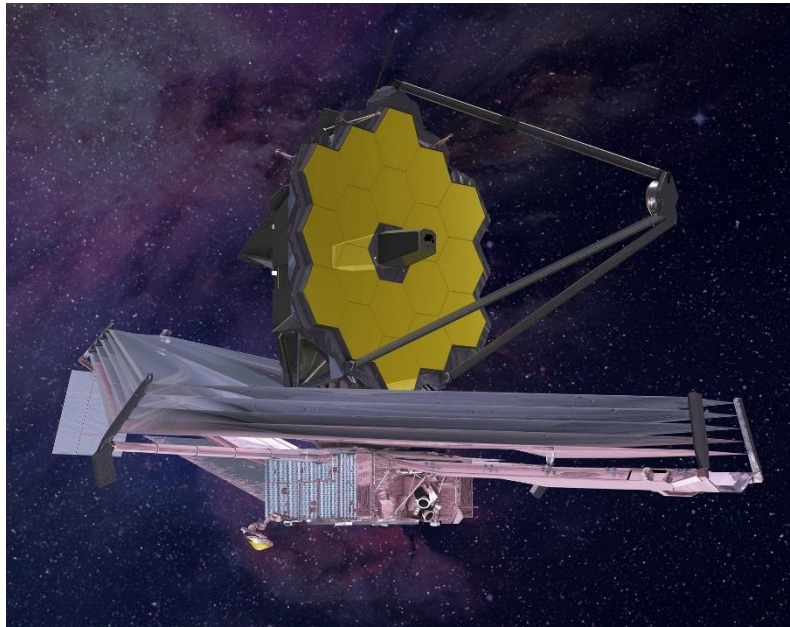
Secondary
Mirror

L2 Halo Orbit

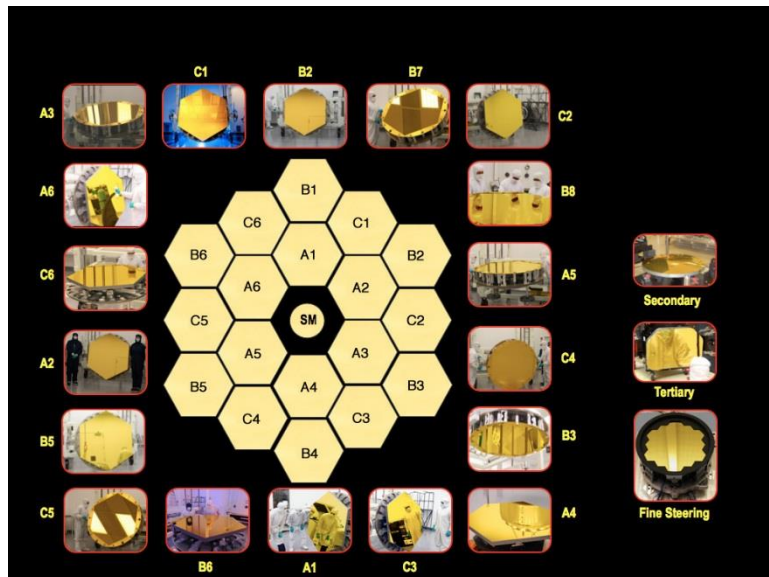
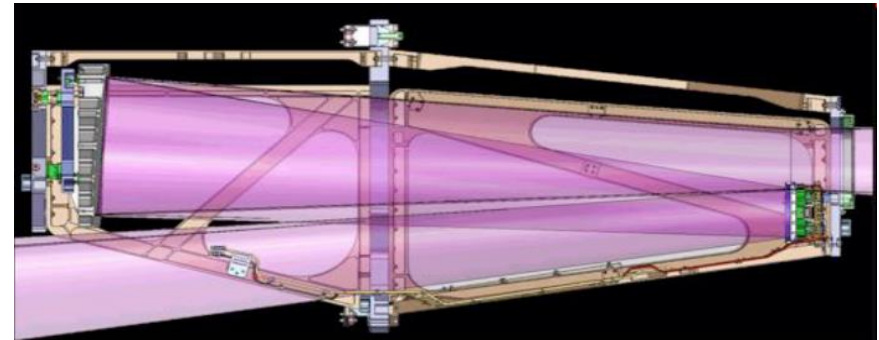




Optical Telescope Element (OTE)



Aft-Optics System

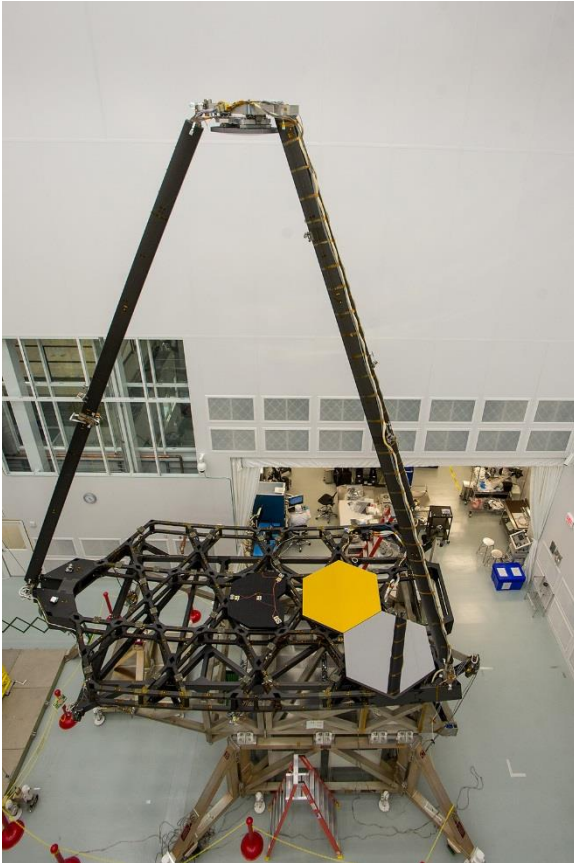


SI Field Location	Requirement (RMS WFE, nm)	Measured (RMS WFE nm)
NIRCam	131	114
NIRSpec	131	119
MIRI	131	117
NIRISS	150	119

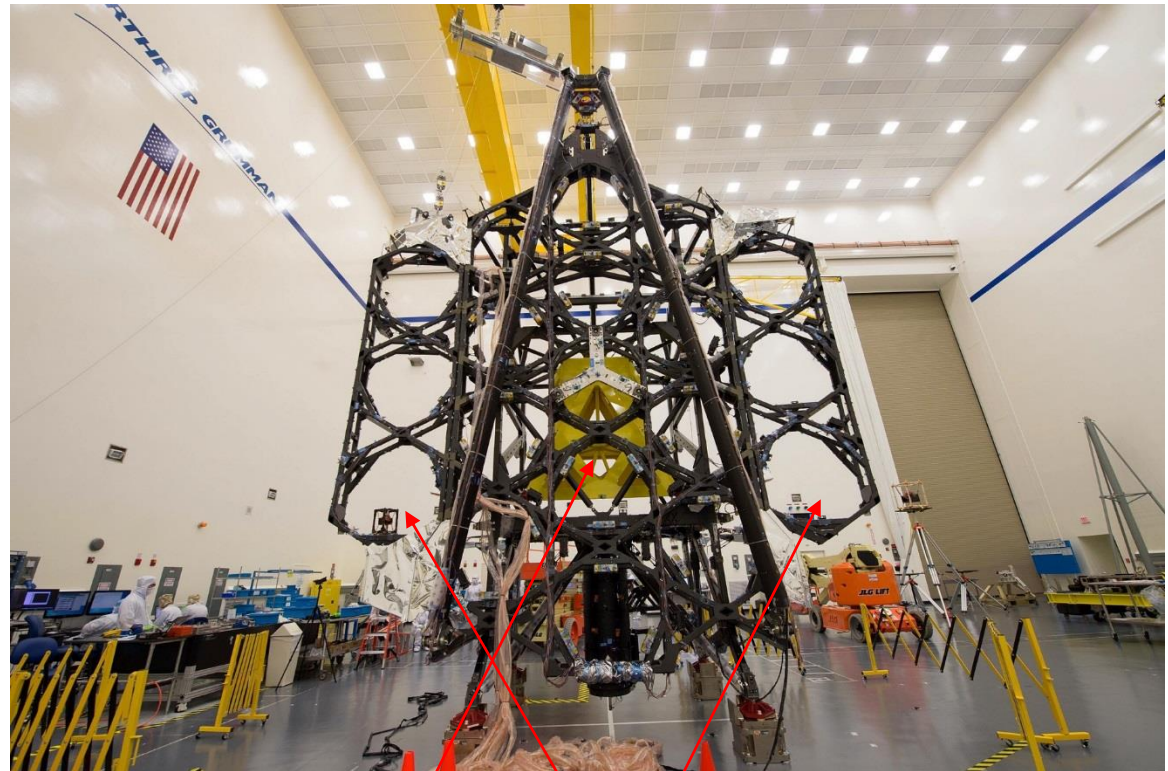
See Atkinson 9904-2⁵

Telescope Structure

Pathfinder



Flight Telescope Structure

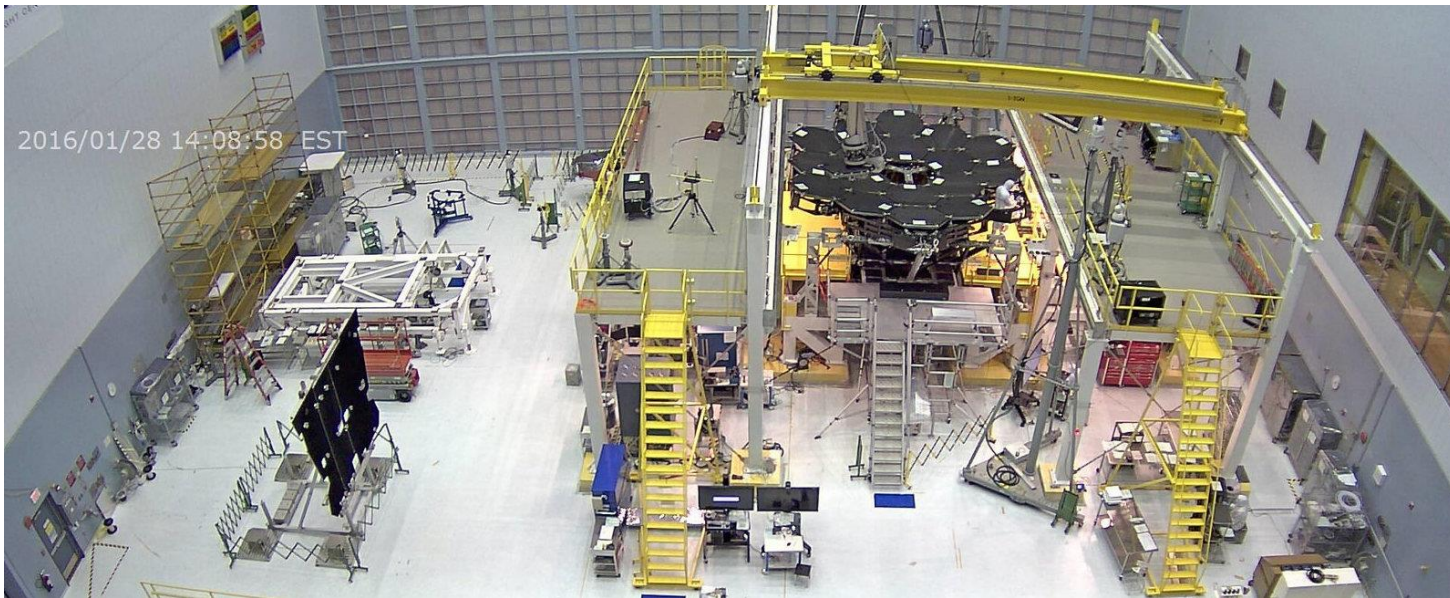


Center Section
(CS)

Wings



JWST OTE Integration



Primary Mirror Installation



Secondary Mirror Installation



AOS Installation



See Matthews 9904-3



Optical Telescope Element (OTE)



JWST OTE +V1



JWST OTE +V3, SM Stowed



JWST OTE –V1, ISIM Installation



ISIM Installation from AOAS



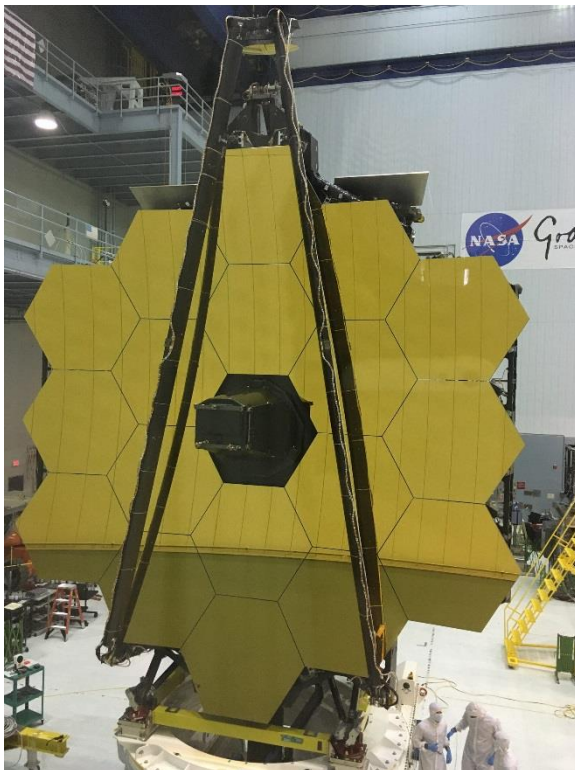


OTIS Integration and Test Program



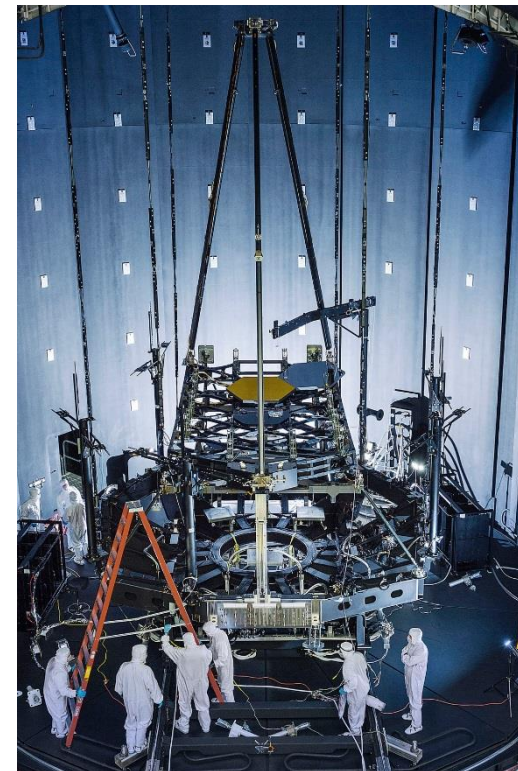
Ambient Testing at NASA Goddard

- Test data taken before and after acoustic/vibrational testing
 - Primary mirror metrology
 - Primary mirror structure dynamics, deployments, and electrical testing



Cryogenic at NASA Johnson

- Optical Workmanship
- Optical Alignment
- Thermal balance
- Operational Interfaces



See Feinberg 9904-6¹⁰



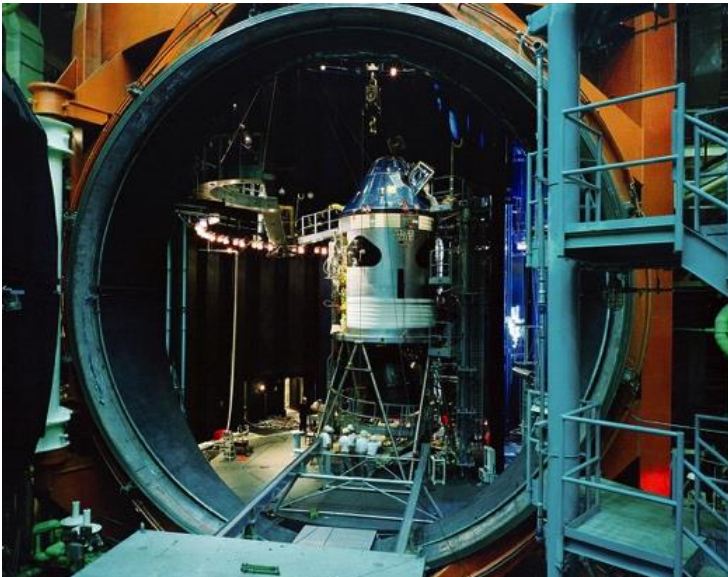
Johnson Space Center Chamber A



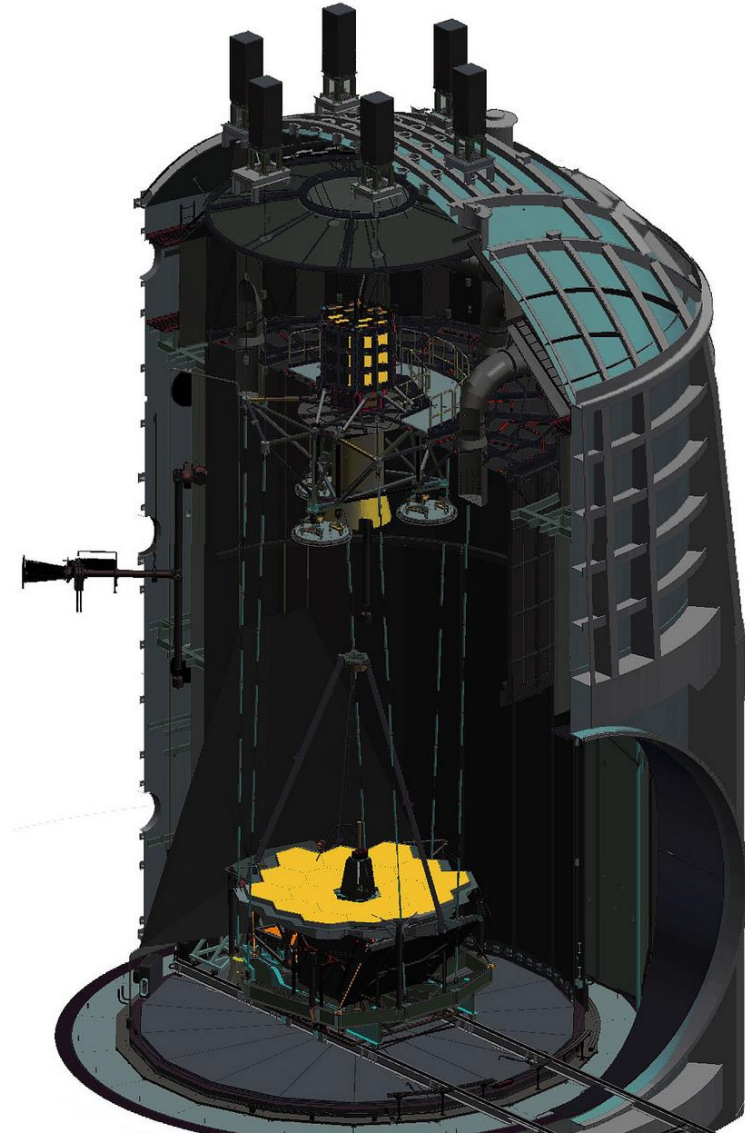
JWST Space Telescope Transporter for Air, Road and Sea (STTARS)



Apollo command module test in JSC's Chamber A (1968)



JWST configuration for OTIS cryo-test inside JSC's Chamber A (2017)

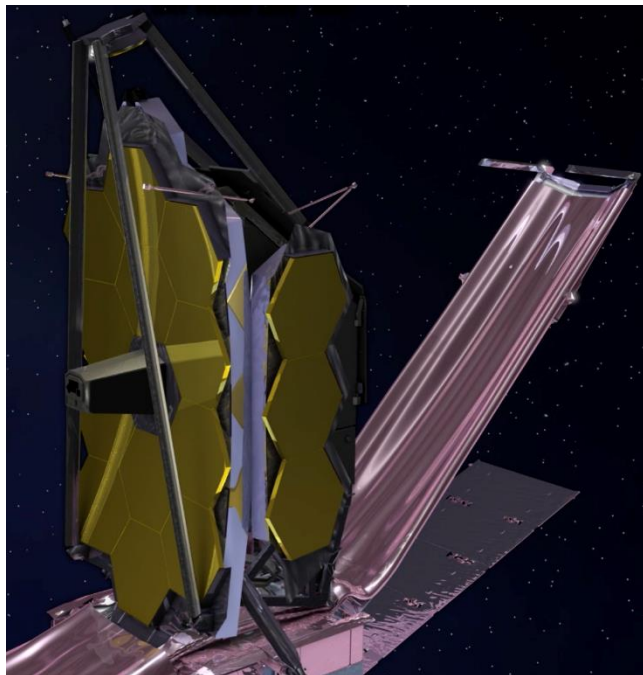




Sunshield



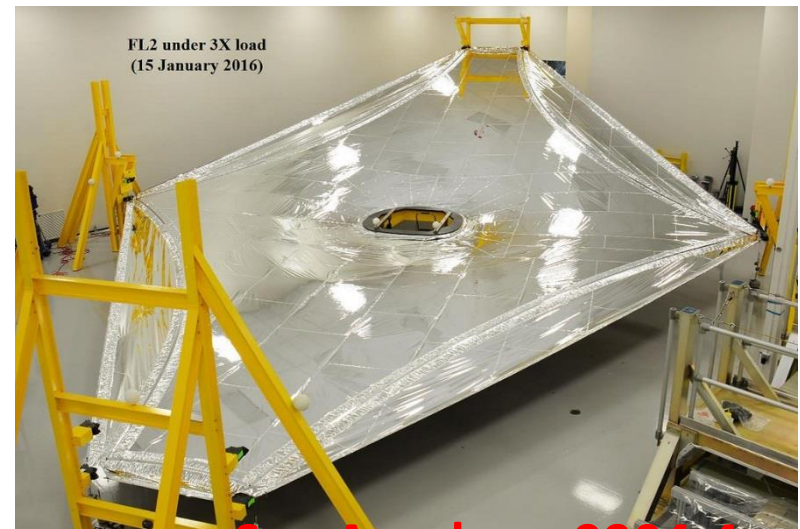
- Five separate sunshield layers manufactured by NeXolve.
 - Layers tensioned to flight-like configuration
 - Shape measured in 3-dimensions using lidar
 - Modeling of layer to layer alignments
- Full-sized flight simulator tested



Full Sized Test Article at NGAS



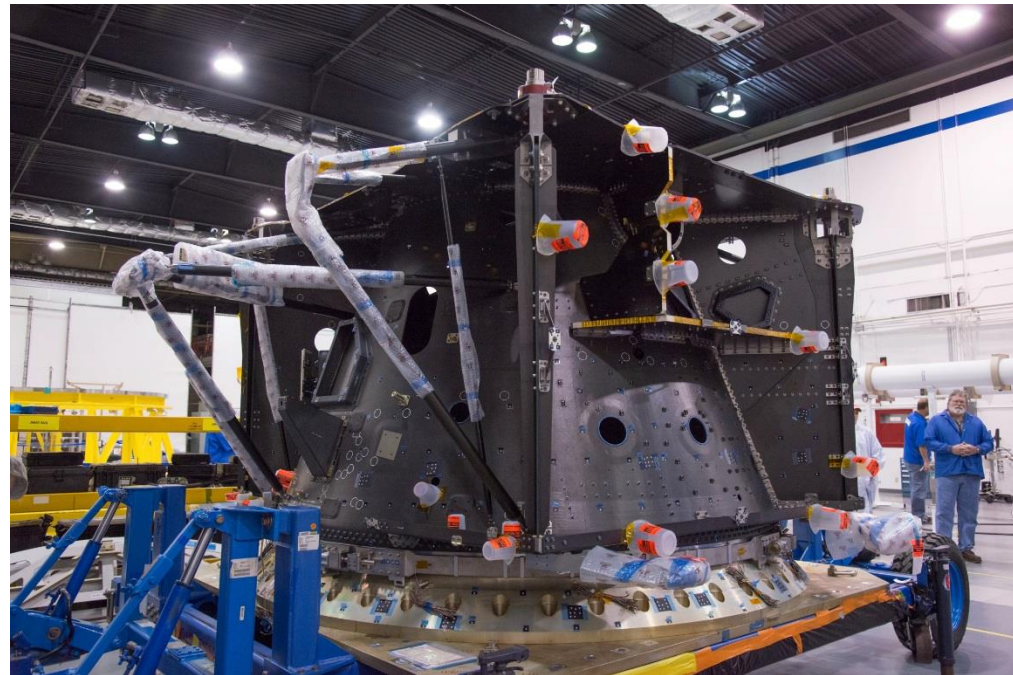
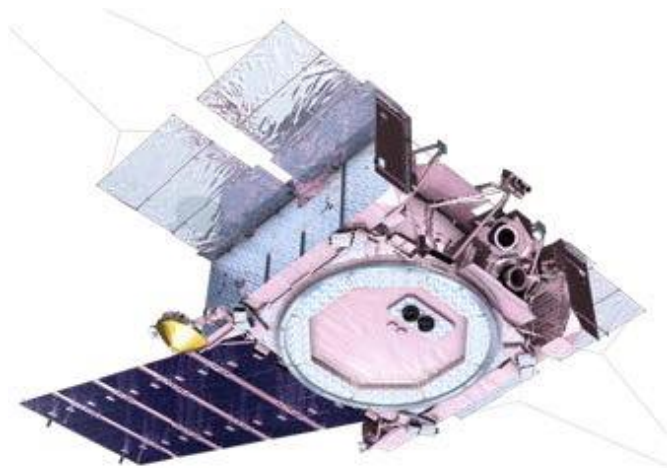
Flight Sunshield Layer 2



See Arenberg 9904-4



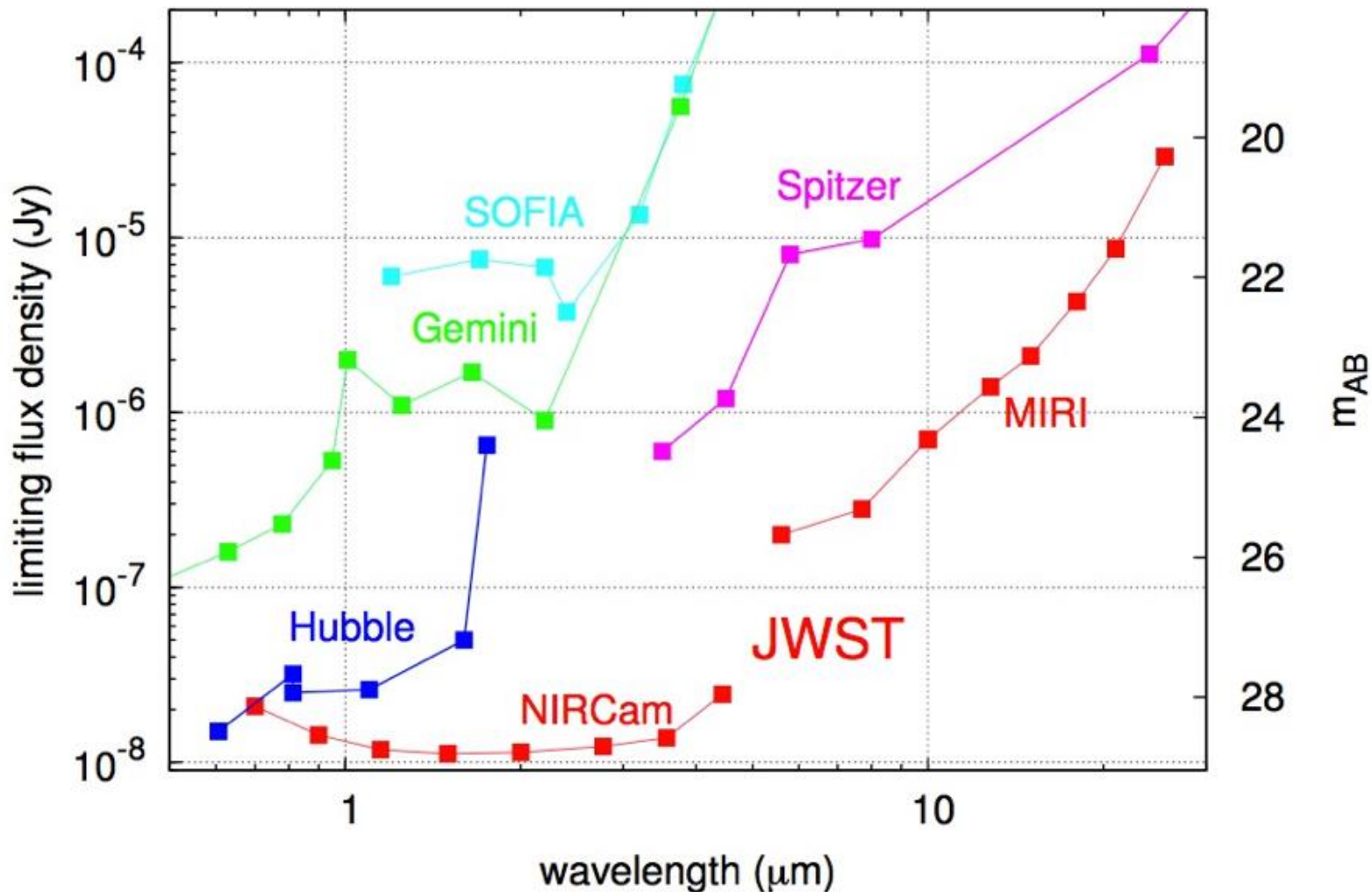
Spacecraft Bus





Observatory Sensitivity: Imaging

photometric performance, point source, SNR=10 in 10^4 s

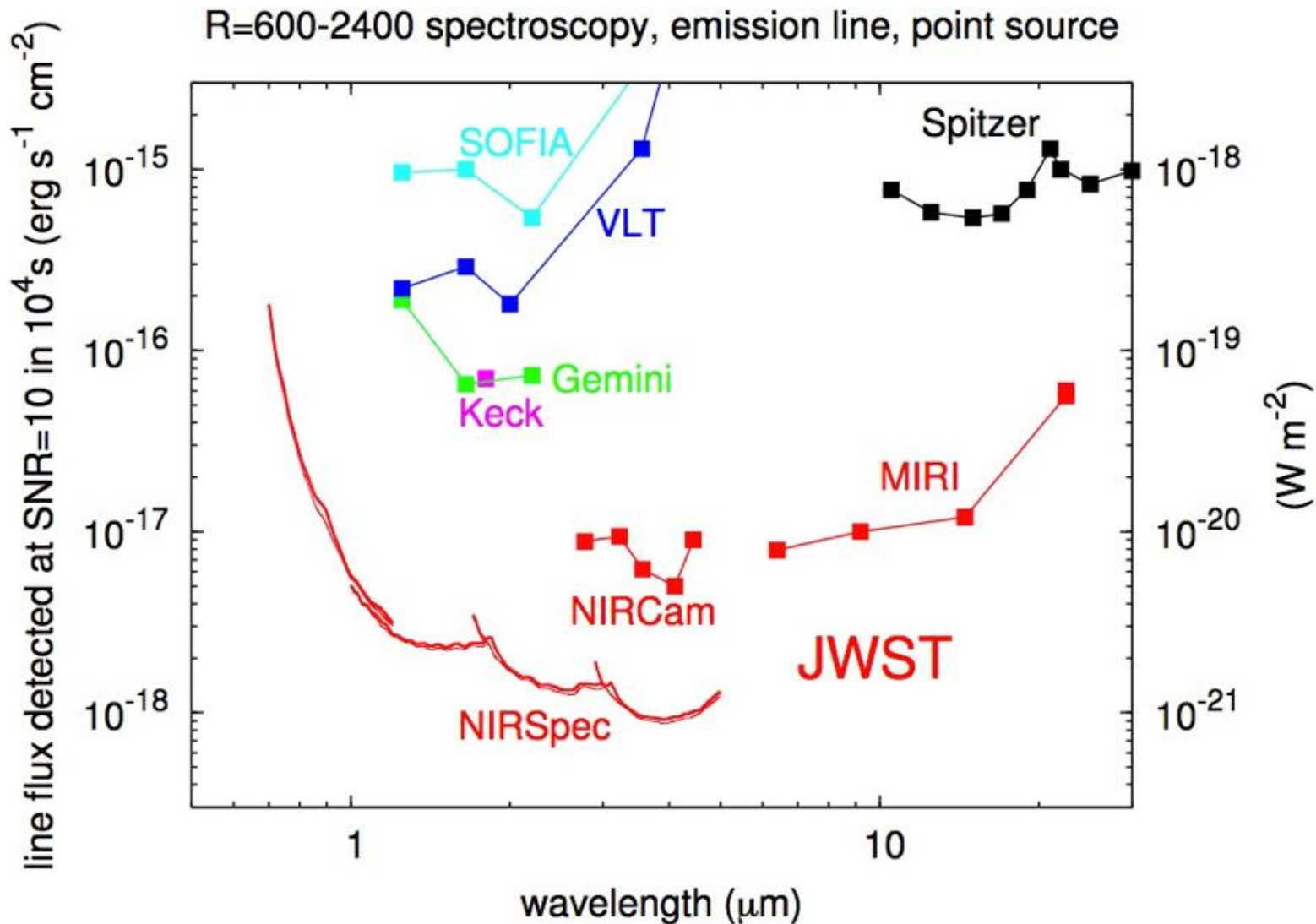


See <https://jwst.stsci.edu/science-planning/>

Courtesy of Jane Rigby



Observatory Sensitivity: Spectroscopy



See <https://jwst.stsci.edu/science-planning/>

Courtesy of Jane Rigby

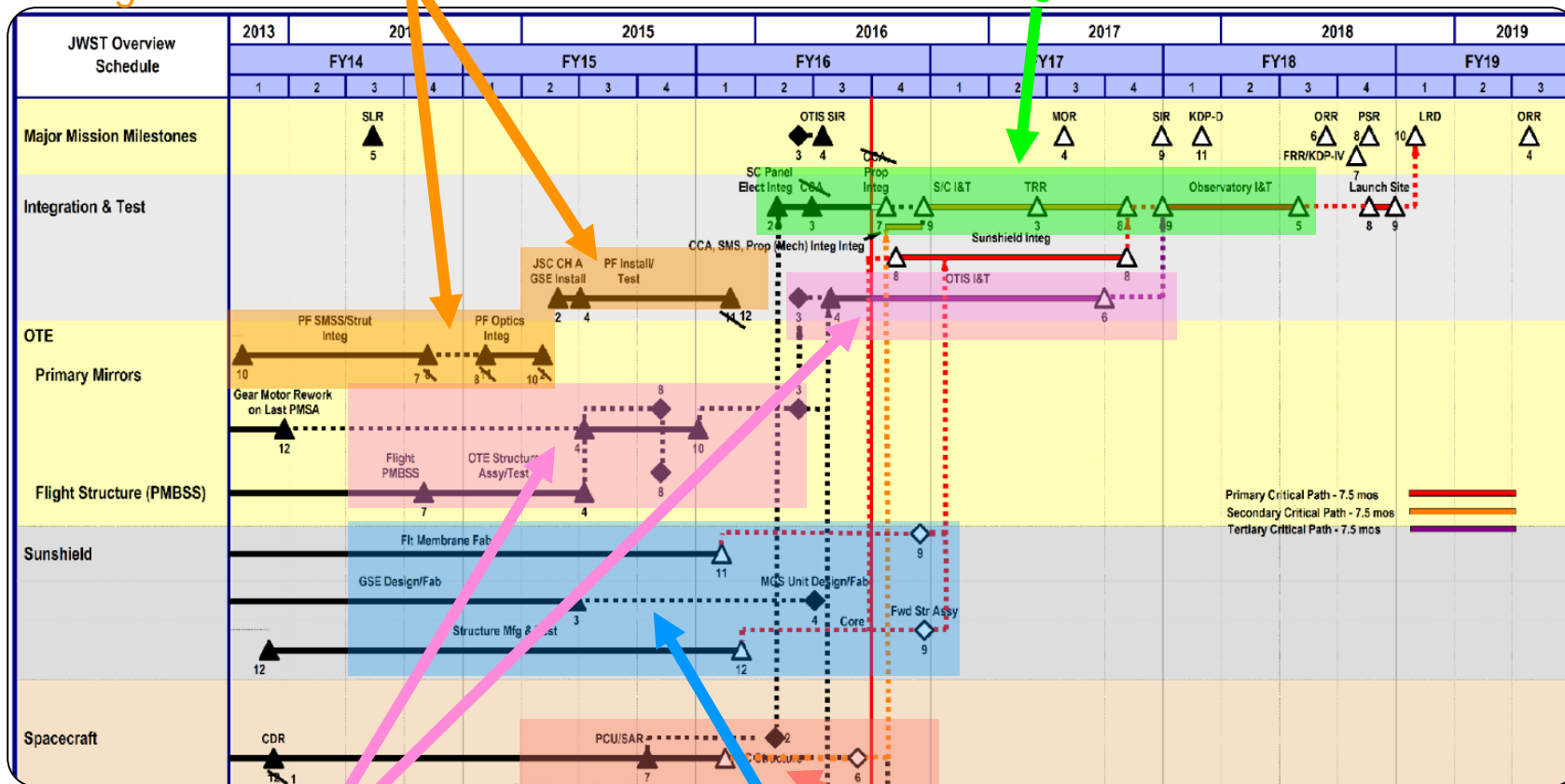


Observatory Schedule



Pathfinder backplane/SMSS
- integration & test

Telescope/Sunshield/Spacecraft
- integration & test



Primary Mirror Support Structure:
- Assembly completion and cryo-test
- Mirror population

Sunshield Flight Membrane fabrication:
- Sunshield structure integration and test

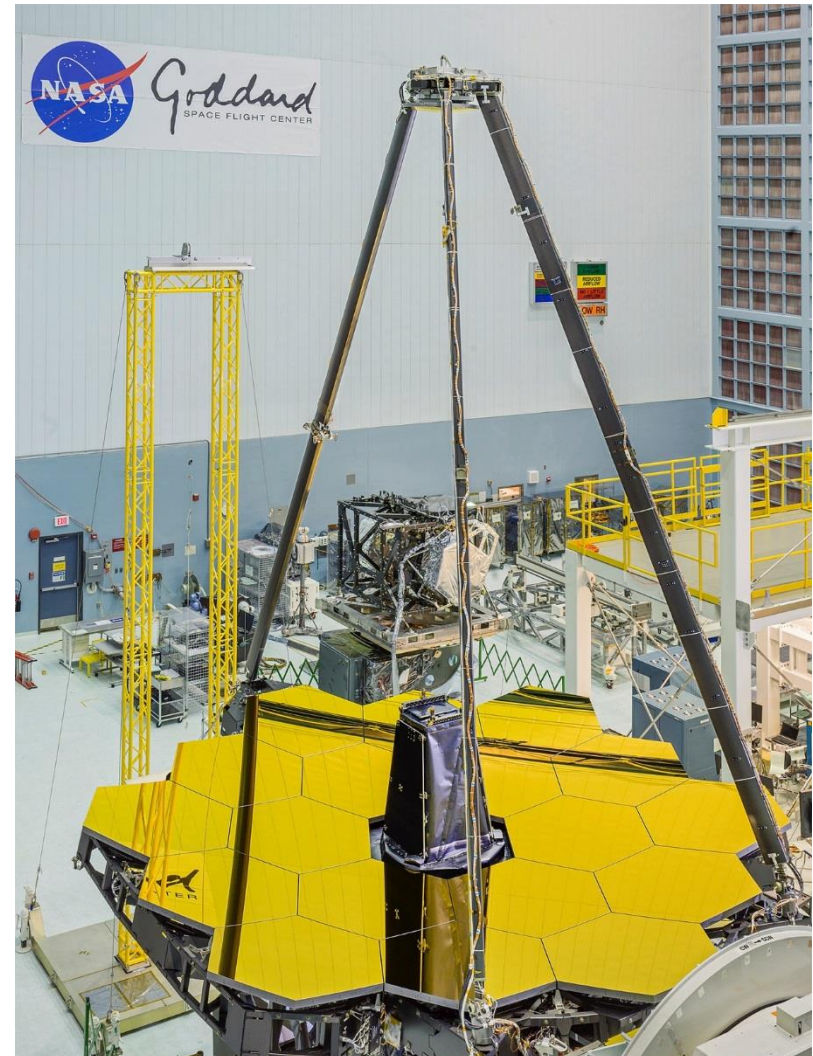
Spacecraft: Fabrication & subsystem integration



Summary



- JWST will carry out transformative science from the very early universe and across cosmic time.
- JWST OTE and ISIM have been combined to form OTIS, which will commence environmental testing.
- The full JWST team has made tremendous progress since the last AT+I meeting in 2014.
- JWST on track following 2011 replan and remains on schedule to launch in October 2018.

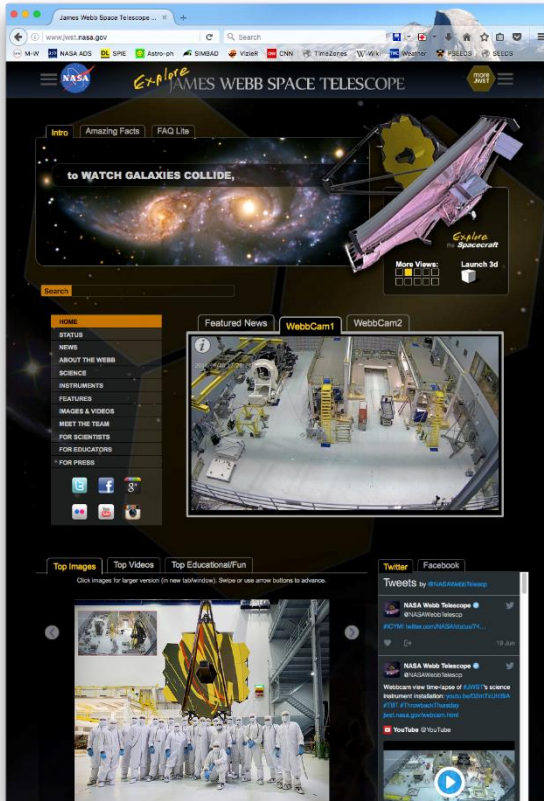




Following JWST

Webpages

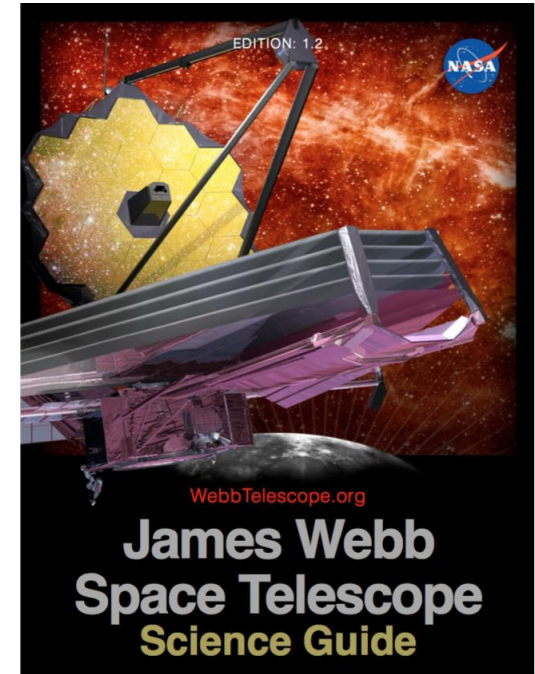
www.jwst.nasa.gov



webbtelescope.org/



Webb e-book



Social Media

Webcam

www.jwst.nasa.gov/webcam.html

